STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:) CASE NO. 11179

APPLICATION OF MERIDIAN OIL INC.

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: David Catanach, Hearing Examiner

JAN 3

January 5, 1995

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Division on January 5, 1995, at 2040 South Pacheco, Santa Fe, New Mexico, before Diana S. Abeyta, RPR, Certified Court Reporter No. 168, for the State of New Mexico.

I N D E X

January 5, 1995
Examiner Hearing
CASE NO. 11179

E X H I B I T S

A P P E A R A N C E S

FOR THE DIVISION:	RAND CARROLL, ESQ. Legal Counsel Oil Conservation Division 2040 S. Pacheco Santa Fe, New Mexico 87505
FOR THE APPLICANT:	KELLAHIN AND KELLAHIN Post Office Box 2265 Santa Fe, New Mexico 87504-2265 BY: W. THOMAS KELLAHIN, ESQ.
FOR RAY LEESON:	MR. RAY LEESON Post Office Box 8 Lindrith, New Mexico 87029

EXAMINER CATANACH: At this time we'll call the hearing back to order and call Case 11179.

MR. CARROLL: Application of Meridian Oil Inc. for designation of a portion of the Entrada formation as an exempted acquifer and to amend Division Order No. R-10168, Rio Arriba County, New Mexico.

EXAMINER CATANACH: Are there appearances in this case?

MR. KELLAHIN: Yes, Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin and Kellahin, appearing on behalf of Meridian Oil Inc., the applicant, and I have three witnesses to be sworn.

EXAMINER CATANACH: Are there additional appearances in this case?

Yes, sir?

MR. LEESON: Ray Leeson from Lindrith, New Mexico.

MR. CARROLL: Would you spell your name for the record, please.

MR. LEESON: L-E-E-S-O-N.

MR. CARROLL: Okay, thank you.

EXAMINER CATANACH: Mr. Leeson, you are here just on behalf of yourself?

MR. LEESON: Yes.

EXAMINER CATANACH: Mr. Leeson, do you plan on

asking questions of Meridian's witnesses, or just do you plan on making a statement?

MR. LEESON: Yes, I do.

EXAMINER CATANACH: You would like to cross-examine the witnesses?

MR. LEESON: I would like to ask some questions, whether it's cross-examination or not, I don't know.

EXAMINER CATANACH: Okay. Mr. Kellahin, you may proceed.

MR. KELLAHIN: Thank you, Mr. Examiner. At this time, I would like to have my witnesses sworn.

EXAMINER CATANACH: Mr. Kellahin, do you have an extra set of exhibits?

MR. CARROLL: Yes, sir, we're about to get there.

EXAMINER CATANACH: Witnesses please stand to be sworn in.

(Witnesses sworn.)

MR. KELLAHIN: Mr. Examiner, I have distributed to the division and the court reporter, and I hand Mr. Leeson a copy of Meridian's proposed exhibit package so that he might have available to him the exhibits we propose to introduce, Mr. Examiner.

Contained in the exhibit book, Mr. Examiner, you will find the order that the division issued that approved the drilling of the Jillson Well as a disposal well. I

would like to hand you an additional copy of that so that I might refresh your recollection about what the division has done.

This case was originally presented to Examiner Stogner back on August 4th of '94, the purpose of which was to comply with the division's requirements under the underground injection control regulations to have approval to drill a new disposal well identified as the Jillson Federal SWD Well No. 1. The available information presented to Examiner Stogner was that this well would be drilled into the Entrada formation, and they forecasted a certain vertical depth. The applicant presented sufficient evidence at that time to satisfy the division to authorize the drilling of this well. And the well, in fact, was drilled. Part of our of request today is to have you modify for us the actual perforated interval into the Entrada, which based upon actual drilling of the well, is slightly different and both the technical geologist and engineer can explain to you that difference, but that's one of the items for your attention is a small modification in the order, which is R-10168, issued in case 11042.

You may recall from memory, and we are here to demonstrate to you today, that the Entrada acquifer is widely utilized in certain portions of the San Juan Basin as a salt water disposal acquifer, which produced salt water

from oil field operations can be utilized as a means of disposal, and we have mapped those for you and we're going to show you where you've approved Entrada disposables.

What occurred is Meridian in compliance with this order drilled and completed and tested this disposal well. They established, based upon extensive testing of the acquifer prior to commencing any disposal, that water analysis demonstrated that the total dissolved solids that were produceable at this location in the Entrada were less than 10,000 milligrams per liter. There are several tests; they approximate 7,000 milligrams per liter total dissolved solids.

We have not utliized this for disposal because it falls below the 10,000 criteria, and therefore, we asked our technical engineers to determine what portion of this acquifer would be subject to or influenced by these disposal fluids if this well is utilized for that purpose. We're going to present to you an engineering reservoir witness who will explain, by his calculation, we're dealing with a radius of influence around this disposal well of about 1,400 feet. We have extensively studied the available data and both technical witnesses will address that issue.

Pursuant to the Safe Drinking Water Act and the rules and regulations developed by EPA and as administered by this agency, we are asking for a portion of this acquifer

to be exempted. And when you see the data, you will see the portion we have scribed for exemption allows you to take this circle, which has a radius of 1,400 feet, and contain it then within this geographic area. In addition, to make sure that we had notified anyone that might have any interest, we notified anyone within 2 miles of the radius of this wellbore, even though we expected its radius of influence to be only 1,400 feet. In doing so, we will identify and show you where we believe Mr. Ray Leeson's property is. It will be our conclusion that we are not adversely affecting anything that may happen now or in the future with regards this this portion of the acquifer. None of the exempted acquifer for which we are requesting you to act lies adjacent to or within the boundaries of Mr. Leeson's ranch.

The end result of that presentation is we're going to ask you to recommend then to the EPA that a portion of this acquifer be exempted so that we might utilize it for disposal purposes. To do that, I want to call Mr. Van Goebel as the first witness. He will describe for you, as a landman, what has occurred up to now, and then we'll follow with the geologic witness, and finally the engineering presentation.

VAN GOEBEL,

the witness herein, after having been first duly sworn

upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. KELLAHIN:

Q. For the record, Mr. Van Goebel, would you state your name and occupation, sir.

A. My name is Van Goebel. I'm a landman for Meridian Oil.

Q. Where do you reside, sir?

A. I live in Farmington, New Mexico.

Q. On prior occasions, Mr. Goebel, have you testified before this agency as a qualified expert in matters dealing with petroleum land management?

A. Yes, I have.

Q. In addition, were you the land expert that's assigned to Meridian's team that dealt with the Jillson Well when it was first asked to be permitted and drilled?

A. Yes, I was.

Q. Have you continued your involvement in that profession with regard to subsequent activities for this well?

A. Yes, I have.

MR. KELLAHIN: We tender Mr. Van Goebel as an expert petroleum landman.

EXAMINER CATANACH: He is considered qualified.

Q. (BY MR. KELLAHIN) Let's describe, before we get

into the details, how Meridian has organized the exhibit book for presentation.

A. Okay. Under Exhibit 1, we have the application that we have submitted to exempt the portion of the Entrada formation. Under Exhibit 2, we have a breakout summary of references to the various exhibits included in the book. Also, there is a plat showing the injection radius under that exhibit that we expect. Under Exhibit 3 is a locator map showing the Jillson well locations in reference to New Mexico. And also in there are plats showing the two-mile radius where we notified offset operators and also surface owners. Under Exhibit 4, we have the water analysis and the test results done. Under Exhibit 5 we have topographic map where we have shown the location of the Jillson well, the injection radius and the 1 1/4 mile radius out from that, which is required under federal/state regulations for notice of water wells. Also, there is a topographic map showing where we have spotted water wells in the area. And again showing the two-mile radius, the injection radius, and the required 1 1/4 mile radius. And included also in there is a wellbore diagram. Under Exhibit 6, again, we have analysis tables of the water. And under Exhibit 7, we have a geological study and logs provided. And then under Exhibit 8 is a cost breakdown if you were to drill a water well and attempt to produce a

water well and put facilities on it at that depth.

MR. KELLAHIN: Mr. Examiner, I misspoke in my introductory comments to you. I have confused two numbers. The 1,400 foot radius number is not correct. I had confused the acreage affected by the disposal, which is 1,442 acres, the radius of which is 4,440 feet.

MR. LEESON: Come again on that.

MR. KELLAHIN: Yes, sir. The radius which is shown on Exhibit 2, there will be an engineering calculation where we'll demonstrate to you the radius that we're relying on is 4,440 feet. My statements with regards to the position of that radius, however, to Mr. Leeson's ranch is still correct.

Q. All right, let's turn, Mr. Goebel, to the information behind exhibit tab No. 3. Describe that figure or illustration to us, sir.

A. Okay, the first map is a locator map showing the Jillson well location in New Mexico. It is approximately 6 miles east of 537. And approximately 6 miles west of Lindrith.

Q. Have you been in this area?

A. Yes, I have.

Q. Are you familiar with the topography and the conditions of the surface and what use is made in this particular area of that surface?

A. Yes.

Q. All right. Let me have you then, let's go back and find exhibit tab No. 2. There will be some printed material. If you will turn behind that and you will find Exhibit A, figures 1 through 10. If you will continue to turn and find the first display that shows the circle that says "Ultimate Injection Radius"; are you with me? All right, we're behind exhibit tab No. 2, and if you start there in the front. There you go.

Were you advised by the technical members of your team as to what they had calculated to be the ultimate injection radius, if you will, for fluids disposed of in this disposal well if the division approves the exemption of this portion of the Entrada acquifer?

A. Yes.

Q. And what was the radius that you were told to use?

A. We used -- on the page before this plat is the calculations that they used to determine the radius. The circle on the map is showing how that radius comes out in relation to the sections in the area.

Q. All right. So when we look at this map, that circle represents the radius the technical people have told you is the radius of influence for disposal fluids introduced into this well in the Entrada formation?

A. Yes.

Q. What else is shown on this display?

A. Well, also on this display we show the Jillson well. Also, we show the sections surrounding the well, along with well symbols, the type of wells that are productive in the area.

Q. Can you give us a sense of where we are? Where is the Jillson well in relation to any roads or highways?

A. Okay, if I may refer back to Exhibit 6.

Q. All right.

A. Let me try Exhibit 5.

Q. Okay, how about 5.

A. Can you see a topographic map?

Q. It's the one with the green shading on the white background?

A. Yes. Okay, on this map we have indicated the location of the Jillson well in regards to roads in the area. West of the Jillson we have the Jicarilla Reservation boundary, and they have a road which would be called J-19, which would be like their county roads.

Q. Can you approximate for us where the eastern boundary of the Jicarilla Apache Reservation is?

A. As you see Section 7 there?

Q. Yes.

A. I would say that the western boundary there of

the section would probably be the boundary line for the Jicarilla Reservation.

Q. Western boundary of 7 is the eastern boundary of the reservation?

A. Yes.

Q. Okay. How is that east-west road there defined? What is that?

A. Okay. It's used as a major road from Highway 537 to Lindrith. It's a gravel, dirt road.

Q. Do you know what the classification is on the state system? Is it a state road or is it private road; what is it?

A. No, I don't believe it's a state road. I'm not sure if it's classified as county road or not.

Q. How is it identified by you and others in Meridian? Does it have a name or a number?

A. Usually we use the Jicarilla route number, the J-19 route number. Also, on 537, there are signs on the highway indicating that it's a road to Lindrith.

Q. If I were going to the Jillson well, or if Meridian personnel were going to that well, how would they get there?

A. They would come down 44 where 537 intersects with 44 at the Tepee rest area. You would then go north on 537 until you came to the Jicarilla J-19 road, or you would see

a sign on the highway indicating the road goes to Lindrith.

Q. What is the surface of this immediate area being used for, Mr. Van Goebel?

A. It's used for oil and gas production. There is cattle ranching in the area.

Q. Does Meridian or any of its personnel have to utilize any portion of the surface of Mr. Ray Leeson's ranch property in order to access or service the Jillson well?

A. No.

Q. Let's find a map and find the relationship as you believe his ranch property is to the Jillson well.

A. Okay, if we go back to Exhibit 3, and then five pages in, there is a map showing the surface --

Q. Hang on just a minute. We're all on the same page.

A. There is a map showing the surface ownership in the area. And, again, we have shown our two-mile radius where we made notification.

Q. All right. Describe for us the bottom of the legend and show us the way the map is coded to reflect the different surface ownerships.

A. The legend indicates the surface ownership. It's done by crosshatching. You can see Mr. Leeson's property is up in the northern portion of the plat with the crosshatching.

Q. When you compare back and look at the ultimate injection radius map behind exhibit tab No. 2 with your plat that shows your knowledge of what his acreage position is, do you find any portion of this proposed Entrada acquifer that we're requesting an exemption to lie within the boundaries of his ranch?

A. No, it does not affect his ranch boundaries.

Q. Did you cause notification to be sent to all the surface owners within a two-mile radius of the Jillson Federal well?

A. Yes, we did.

Q. What, if any, objections or inquiries did you receive, Mr. Goebel?

A. Mr. Leeson's would be the only one.

Q. Did you have any objection from any of the offset operators?

A. No, we have received no objections.

Q. Have you met with Mr. Leeson to discuss with him what his concerns and objection were to this particular activity we're seeking approval for?

A. I talked to him briefly before we met today, this morning.

Q. And what do you understand to be the issues of concern for him?

A. He's indicated that in the area where his land is

is that he has concerns over road conditions, and that also he wanted to be here because of his interest to see how we were going to inject into this well, and concerns about the water.

Q. With regards to the surface use issues for activities seperate and apart from this well, how are you addressing his concerns?

A. Next week our personnel will meet with him to discuss his road conditions.

MR. KELLAHIN: That concludes my examination of Mr. Goebel. We would move the introduction of the information that he's described, which is a portion of Exhibits 2, 3, and 5.

EXAMINER CATANACH: Exhibits 2, 3, and 5 will be admitted as evidence.

Mr. Leeson, do you have some questions of this witness?

MR. LEESON: Does this conclude the whole thing?

EXAMINER CATANACH: No, sir, this is just the first witness. He has testified as to the land matters, the land ownership, and subjects like that. There will also be an engineer and a geologist testifying later on.

MR. LEESON: Well, a lot of these questions are being answered that I have asked, but I am wondering what other waste disposal methods there are available other than

this Entrada?

MR. KELLAHIN: Let me suggest this, we're certainly willing to let Mr. Leeson have any witness recalled later, so if something occurs to him that a subsequent witness has not answered, we will certainly have no objection to having Mr. Gobel come back on the stand so Mr. Leeson may ask any question that he thinks is relevant.

I think we're going to get to your question with the next witness.

MR. LEESON: Okay.

EXAMINER CATANACH: Do you believe you have any questions, Mr. Leeson, regarding land issues or land ownership or anything like that?

MR. LEESON: Yeah, I have some, but some of them will be answered, but some of them won't. There's some of it has to do with the reputation of the company itself.

EXAMINATION

BY MR. LEESON:

Q. Is it true that you drilled the Cullens No. -- what, 7 -- 6 right there south of my ranch?

A. Yes, we did.

Q. Okay. Is it true that you had to go back and do some recementing on that well?

A. Yes, we did.

Q. Why?

A. I don't think I would be in a position to answer that.

Q. You've got seven people here and you can't answer that one, huh?

EXAMINER CATANACH: Well, Mr. Leeson, this witness is not an expert on engineering or geology. He's limited to land matters.

MR. LEESON: Okay, that's what I was afraid of.

EXAMINER CATANACH: Okay, but we --

MR. LEESON: I'm kind of an old rancher, and I try to do the best that I can. I don't understand all this, but I'm trying to absorb it as fast as I can.

EXAMINER CATANACH: This witness here is just a landman, and he really isn't qualified to answer technical questions regarding cementing of wells and things like that. But you will have the opportunity to ask an engineer that question.

MR. LEESON: What are the other land issues? Can I deal with roads?

Q. How many wells are going to supply waters to this well over what area?

A. We operate a number of wells both on the Jicarilla reservation and off the reservation, and we would use this disposal well to dispose of that produced water.

Q. What routes do you intend to --

A. One reason why we picked this location was its access off of 537, in that we could come down the pavement and then come in through J-19 on that road to come in for disposal.

Q. Do you realize the impact that's already on that road?

A. Yes, it's a well-used road.

Q. Is it a dirt road, graveled road, or paved road; what is it?

A. It's a dirt road.

Q. It's a dirt road. Do you know whether there's clay, sand, gravel in the majority part of it or what?

A. The last time I was on it, there was some parts were sandy, some parts were clay.

Q. Are you aware of the period of time when that road is impacted to the point where it's practically impassible?

A. I'm not familiar with that period of time.

Q. Okay.

A. It is our understanding, though, that on the Jicarilla side, that the Jicarilla's have established a highway department. In the portion on their side, their highway department is going to start maintaining that first part of the road.

MR. LEESON: Am I stepping out of the bounds of

this well in dealing with this in this way?

EXAMINER CATANACH: No, sir.

MR. KELLAHIN: Well --

MR. LEESON: I'm going to submit to you --

MR. KELLAHIN: We need to suggest to Mr. Leeson that if he has something to submit, he will have a turn to do that at the conclusion of our presentation, unless you want to hear it now. I'm being patient because I understand that he doesn't do this kind of work. Surface use is not an issue for you, Mr. Examiner, within the context of this case, and it's not relevant. I'm happy to have a short discussion simply so we can air the issue, but it's not relevant.

MR. LEESON: I would have to differ with the attorney in that for 40 years it has been very relevant. It was originally my dad's access road when he homesteaded there.

MR. KELLAHIN: Mr. Leeson, I'm going interrupt you, because I don't think you understood me. It may relevant to you and Meridian, but any dispute you have about surface use is not this agency's responsibility. And if you've got a complaint, these people can't help you one way or another.

MR. LEESON: Let me ask another question. You are going to haul stuff over these roads? You are going to

impact these roads; is that right?

MR. KELLAHIN: That's a given, yes, sir.

MR. LEESON: How can you divorce that from the well? Because those products are hauled into the well and deposited at the expense of the people who travel that road.

MR. KELLAHIN: Because this agency doesn't have jurisdiction over surface use. They are not going to tell Meridian they cannot or can use a particular road for this activity. You are in the wrong forum to air that complaint.

MR. LEESON: This is what we've heard over the years for the last 40 years, and they say, "Get the oil companies together," and they pass it off. And even to the point where the Secretary of Interior gave an order to make a road policy, the oil company hired attorneys and got it watered down so that the only statement from that policy is that roads will be maintained.

Do you have an interpretation for road maintenance, or do I give it to you the way the oil companies look at it?

MR. KELLAHIN: Mr. Leeson, if you want to bring a matter before this agency, it must be relevant to their jurisdiction, and you're now talking about something that's not within their jurisdiction. And if we can get back on point, we can get through the case.

But his whole agenda in coming in here is to

dispute road conditions, and he's in the wrong place.

MR. LEESON: I'm also disputing water. I started to question that a while ago.

EXAMINER CATANACH: I'm not sure -- we don't have jurisdiction over roads, Mr. Leeson. I can't --

MR. LEESON: Well, okay, that's all right. The water condition was another thing, and you said he would address it in a little bit.

EXAMINER CATANACH: Yes, sir. I think that the road situation, I think that is, as Mr. Kellahin stated, that is between you and Meridian. I'm not sure we can help you with that. Now, we can take into consideration your comments regarding the water, the formation, and all the technical stuff about the well, but road conditions, it's just simply out of our of jurisdiction.

MR. LEESON: Okay, I hear you.

EXAMINER CATANACH: Did you have anything else you wanted to ask this witness?

MR. LEESON: Well, I asked one question a while ago, and you said you would cover it later.

EXAMINER CATANACH: When this next witness is on the stand, you can ask him about that.

MR. CARROLL: And, Mr. Leeson, if you have questions of this witness later, Mr. Kellahin has consented to calling that witness back.

MR. LEESON: I appreciate the courtesy.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Goebel, the area that you've determined is affected, that's been determined by your engineers and geologists?

A. Yes.

Q. And that's been determined to be 4,400 -- I'm sorry, I didn't get the --

A. 40 feet.

Q. 4,440 feet; is that right?

A. 4,440 feet.

Q. That's the radius?

A. Yes.

Q. As I understand it, you've notified all operators within two miles?

A. Yes.

Q. And all surface owners within two miles?

A. Yes. We wanted to go beyond the regulation notification circumference. We wanted to try and cover everybody that we could who might have an interest in this project.

Q. Do you recall how many surface owners you notified?

A. The ones that are shown at the bottom of that

plat on Exhibit 3. Those were the only surface owners that we contacted that fell within that two-mile radius.

Q. So you're talking about five different parties essentially?

A. Yes. The Jicarilla Tribe, the Bureau of Land Management, John Shipley, Ray Leeson, and Donald and Paul Candelaria.

Q. I notice that in the original application, Paul and Donald Candelaria showed up at that hearing. Have you resolved differences with those parties?

A. Yes, we have. If you refer to Exhibit 5. On the fourth page of that map that's shown there where we spotted the water wells, you'll see that in Section 8, in the SE 1/4, there's a water well spotted. He had concerns about protecting his water well. So we went out with the Candelarias and measured the depth of their water well, which was 300 feet deep. We set our surface casing then 400 feet, an additional depth beyond what's required by the state to ensure that their water would be protected.

MR. LEESON: That was 400 feet?

THE WITNESS: Uh-huh.

EXAMINER CATANACH: I believe that's all I have of the witness at this time, Mr. Kellahin.

MR. KELLAHIN: I call Meridian's geologic expert that's worked on this project, Mr. Bill Hobbs.

(Thereupon, a discussion was held off the record.)

EXAMINER CATANACH: Are we ready?

MR. KELLAHIN: Yes, sir.

BILL HOBBS,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. KELLAHIN:

Q. Would you please state your name and occupation.

A. Bill Hobbs. I'm a petroleum geologist with Meridian Oil.

Q. Where do you reside, sir?

A. In Farmington, New Mexico.

Q. Mr. Hobbs, on prior occasions have you testified before the division and qualified as an expert in matters dealing with petroleum geology?

A. Yes, I have.

Q. Summarize for us what has been your geologic involvement with the issues surrounding the Jillson well.

A. I was involved with the team that we put together of engineers, landmen, and geologists, being myself, to pick a suitable location to drill a water disposal well to dispose of water in the Entrada formation, put together the original application and -- myself -- I joined the team that

came down for the hearing that we had in August of 1994.

Q. Have you continued to study the geologic information and insofar as it's relevant to your work, engineering matters, to continue to form and refine your opinions about this particular well?

A. Yes, I have.

MR. KELLAHIN: We tender Mr. Hobbs as an expert petroleum geologist.

EXAMINER CATANACH: Mr. Hobbs is so qualified.

Q. (BY MR. KELLAHIN) Let's deal with the relationship of the Entrada in the disposal interval, which is approximately 8,500 feet below surface?

A. 8,400 feet.

Q. 8,400 feet. If you wouldn't mind giving us a site specific or an area specific geologic lesson as we move from the surface on down and identify for the Examiner and Mr. Leeson what are the known acquifers above the Entrada that are available for fresh water uses.

A. Okay.

Q. Is there some way you can illustrate that and describe it to us?

A. Yeah, I think the best way would be to turn to Exhibit 2. About 6 pages from the back of that group of exhibits, there is a spread sheet, which I prepared, that looks like this.

Q. All right, show me, Bill.

A. It's right in front of the two copies of the log from the Jillson well. I put together this spreadsheet to summarize the geologic formation names, relative ages, thicknesses, lithology or rock type, known or expected production, and also remarks as to whether these particular formations or portions of the formations would act as vertical seals.

MR. LEESON: Don't find it.

MR. KELLAHIN: Hang on just a minute.

MR. LEESON: Here it is. Sorry.

MR. KELLAHIN: That's all right.

THE WITNESS: In essence, starting at the surface, the shallow formation is the thin cover of alluvium, approximately 10 feet thick, which is very recent in age. Basically, the next 2,700 feet of rock that we drilled is of Tertiary age, consisting of the San Jose formation, Nacimiento --

Q. (BY MR. KELLAHIN) All right, let me stop you there. Prior hearing, both Candelarias were concerned about having casing in the disposal well set below any known producing acquifer available to them or others in the immediate vicinity?

A. Uh-huh.

Q. Where was that source and what did you do?

A. To our knowledge, all the shallow wells in that area produce from the upper portion of the San Jose formation, which in the vicinity of the Jillson Federal Well is 1,200 feet thick. So those wells were produced from basically the upper third of that formation. And after the hearing we had in August, we decided to move our surface casing and set it 100 feet deeper than we had originally planned. We set it at 400 feet instead of 300 feet.

Q. Are you satisfied, as a geologist, that all those shallow fresh water sands are protected?

A. I am, by virtue of the fact that we did go stratigraphically deep enough and also those formations are very lenticular and do not cover very much horizontal, do not have very much horizontal extent.

Q. Okay. When we're looking for water that's utilized for drinking water purposes in this area, what is the deepest known water that's currently being utilized for that purpose?

A. To our knowledge, that would be 1,100 feet, and that would be the well drilled by the city, or the Town of Lindrith. So to our knowledge, that would still be in the San Jose formation.

Q. Is there, to your knowledge, any municipality, individual, or anyone using, for drinking water purposes, acquifers below the San Jose?

A. Not to my knowledge.

Q. All right, let's continue down. Below the San Jose, do we have any sources of fresh water?

A. I think we'd have to qualify these as potential sources, and as to their freshness, I don't think there is very much available information. The Nacimiento and the Ojo Alamo formation, which together comprise close to 1,600 feet of sandstone, sale and conglomerate, are strongly suspected of containing fresh water, being as how we're not too distant from the outcrop area of those shallow formations. We say that we suspect that they are fresh, because no one has tested the water, including ourselves or the public.

Q. Let's presume the Ojo Alamo is a potential candidate for drinking water. What is the base of the Ojo Alamo in this area; how deep are we?

A. We're 2,700 feet.

Q. All right. From there, down to the top of the Entrada, are there any other potential drinking water, fresh water acquifers?

A. No, not to our knowledge. What we encounter are primarily sequences of sand and shale and some coal in the Fruitland formation. We have three major hydrocarbon producing intervals in this area, the shallowest being the Pictured Cliffs formation, the next would be the Gallup

formation, which produces oil and gas, and the Graneros, Dakota, which is also being fully developed in this area, which produces gas and oil. The Mesaverde formation, which produces gas and condensate and not too far removed from this area, we suspect would be capable of producing minor amounts of salt water. We think it's wet.

Q. All right. When we get down to the top of the Entrada in this vicinity, we're at what, about what 8,400 feet?

A. 8,400 feet.

Q. How thick is the gross Entrada interval at this location?

A. It's 268 feet thick.

Q. What kind of reservoir lithology are we dealing with?

A. We're dealing with a massive sandstone, homogenous sandstone which does not have any shale breaks in it. On logs it appears to be just one continuous sand. It's made up of an amalgamated or coalesced stacked group of aeolian dune sands.

Q. If the engineer is going to present to the Examiner engineering calculations to show the potential area to be affected by utilization of this well for disposal purposes, the engineer needs to work with some geologic conclusions?

A. Right.

Q. And one of the things that would affect his conclusions, is the lithology of the container that he is trying to calculate; right?

A. Right.

Q. Do you as a geologist see any geologic characteristics within this container, which he says has a radius of 4,400 feet, that materially is different than what you've just described?

A. No. There are some minor thickness variations. The W.O. Hughes well, which was kind of our go-by well for picking this area to drill the Entrada well to begin with, was 22 feet thinner. It had 242 feet of the same basic lithology of the amalgamated aeolian dune sands.

Q. Let's turn back in the exhibit book three pages and get to the plat that Mr. Goebel and I started with which has the ultimate injection radius circle. Are you with me?

A. Yes.

Q. Find me the Hughes well in relation to the Jillson well.

A. The Hughes well on this map, if you go almost directly to the lower right-hand corner of the page, oh, about at three-eighths of an inch, you'll see a square well symbol with a number "6" above it. That would be the W.O. Hughes well which was drilled by Mobile. The logged the

Entrada, saw no encouragement for hydrocarbons in the Entrada, and they plugged back and completed that well as a Dakota producer.

Q. Small change in gross thickness between the Hughes well and the Jillson well?

A. Right.

Q. Other than thickness, what other geologic parameters are available for consideration when you examine the Jillson well? You deal with porosity?

A. Porosity, yeah.

Q. If you're trying to take a gross interval and get a net interval, do you have or did you use a porosity cutoff?

A. Yeah, we have used a porosity cutoff of 7 percent, which is what we usually use for the conventional hydrocarbon reservoirs in the basin for producing. We feel that the effective permeability when you get below 7 percent porosity doesn't have much contribution to the well. So using a 7 percent porosity cutoff, that negated or ended up in a net 11 feet less feet of effective reservoir that we would have available for injection purposes.

Q. So when we look at the gross Entrada interval, you're looking at 268?

A. Right.

Q. And when you helped the engineer with the

calculations -- if you will turn one page back now, we have looked at the ultimate injection radius circle. Look one page before that. See the engineering calculations?

A. I'm sorry, we lost 15 feet.

Q. All right. You and the engineer have got the values on this information sheet for the calculation; right?

A. Right.

Q. I want to address porosity. You said you used the 7 percent porosity cutoff?

A. Uh-huh.

Q. Why was that used and why is it reasonable?

A. In the conventional oil and gas wells that we've drilled, when we count net effective pay, we use 7 percent because of the greatly reduced permeability below 7 percent porosity. We don't feel in hydrocarbon-bearing wells, that it's effective, and so vice versa, in an injection well we don't feel it would advisable.

Q. Did you have indications on the log that you had porosity in excess of the 7 percent?

A. Oh, yeah.

Q. How high a range did you go on the log; what's the highest porosity value you had?

A. The highest porosity value we have in the Jillson well is a 22 percent, and in the W.O. Hughes well it's approched 32 percent porosity.

Q. You used the most conservative porosity value, the 7 percent; right?

A. Right.

Q. And by using that low number, you spread out to the maximum possible extent the area of influence by the injection well?

A. Right.

Q. So you have tried to spread this thing out as big as you can?

A. Right. If you had more porosity, then you have a bigger container over a smaller area.

Q. Let's go back through these pages now, and continuing in the book, go past the locator map. You have a detailed written summary, and I assume this is your work product?

A. Right.

Q. And it says "Seals." Please don't read this.

A. No.

Q. One of the issues is do we have an effective seal. We represented to the division, back in August, I guess it was --

A. August 4th.

Q. -- August 4th that we had effective seal in the Entrada. Is your opinion still the same?

A. Yeah, very much so.

Q. Give us the short answer on why the Entrada, in fact, is sealed on the top and the bottom.

A. The short answer is the Entrada lies 5,600 feet below the Tertiary/Ojo Alamo formation, which is the deepest suspected potential water source. Of that 5,600 feet, 3,200 feet of that is primarily shale. So of that 3,200 feet, we also have interbedded or interspersed through that 3,200 feel oil and gas producing horizons, which if -- for water to be able to leak from the Entrada up into the drinkable water sources, the hydrocarbons would have already found those same avenues to go up and pollute the water sources.

So the fact that we have sealed hydrocarbon-bearing, commercially available hydrocarbons within this sealed interval between the water source and the proposed injection interval with no hydrocarbon contamination of the shallow waters, I think that's definite proof that we have an excellent vertical seal.

Q. Turn past the two pages where you have the detailed discussion of the geologic seals and come back to your spreadsheet again. We have talked about the thickness of the Entrada, we have talked about the lithology, now tell me what's in it.

A. In terms of --

Q. Fluids.

A. Fluids, okay. Well, one of the risks that we

foresaw in drilling any location out here in this part of the basin for the Entrada was to stumble into -- and heaven forbid if we made an oil discovery -- so that's why we tried to cozy up a little bit to the W.O. Hughes well, which did look definitely wet on logs. When we penetrated the Entrada, we had Benchmark Company, which are professional geologists that work as mudloggers on the well, they did note that there was about two feet of dead oil stain in the very top of the Entrada, so that hydrocarbons have migrated through the system, but we don't see any evidence of any trapped hydrocarbons.

Q. Is that a surprise to you, as a geologist, that you would have a dead oil stain in the top of the Entrada in the Jillson well?

A. No, it's fairly common of wells in the south part of the basin, really.

Q. In fact, there are portions of the Entrada that you can produce hydrocarbons from, aren't there?

A. Yeah, I think there's five or six, there's either five or six commercially productive Entrada producing fields south and southwest of our location here, Snake Eyes, Media Field, Ojo Encino, and so on. And also, before, when researching our original application, we also noted the number oil shoals in some surrounding wells, the closest being the Ingerson well that Magnolia drilled in Section 20

of 20 North, due west, which did swab oil and a lot of water, but it was too much water to be a commercially productive well.

Q. North and west of the Jillson is the Entrada used as a salt water disposal interval for wells approved by this agency?

A. Oh, yes. I don't know what the number is. There's probably approximately 30 wells due north and northwest of our current location we're talking about.

Q. All right. Turn to the next page and there is a portion of the Jillson log. What portion are we looking at?

A. We just wanted to include it as an exhibit. A portion of the electric log, and behind the electric lock -- well, electric log, I'm dating myself a little bit -- now they call it an array induction log with gamma ray. That's one of Schlumberger's new electric log tools, and behind that is a litho-density log with gamma ray, which is basically a porosity tool.

MR. KELLAHIN: Mr. Examiner, the Jillson log I think is on file with the agency, but if you will allow us, we will submit, after the hearing, a log on that well, and I'll have Mr. Hobbs annotate it and detail it so you'll know where he thinks the fresh water sands are, and to locate the Entrada interval that they are using so that you will have that for your file. And we will certainly supply Mr. Leeson

with a copy of that same information.

This would be a composite log, quite frankly, because the Jillson wasn't logged in the top portion, and we're going to have to combine it with the Hughes well, I guess, or some other well.

THE WITNESS: Yeah, I made a composite log for the original application, so we can just modify that and insert the Entrada portion of the log here to finish that up.

Q. (BY MR. KELLAHIN) All right. You have made a literature search, as a geologist, looking for any hydrologic studies that deal with the topic of the Entrada, have you not?

A. Yes. We initially had an environmental company do the literature search for us and provide us with some basic information.

Q. Let's start with your conclusions, first. Let's start with your geologic conclusions about whether the Entrada is a static acquifer or whether or not it's an acquifer in motion?

A. I really believe it's a -- in this portion of the basin, that the connate waters in the Entrada formation are in a near static condition rather than a moving or flowing condition. This is based on the fact that almost immediately to the north of us the Entrada becomes -- a lot

of the Entrada wells become tight. In places, it is an effective salt water disposal zone because it becomes very highly fractured. But we chose this location because we didn't want to run the risk of running into tight Entrada where it would be unfractured and therefore unsuitable for water disposal.

Q. My point I want you to address is whether or not if the agency approves this certain portion as an exempt acquifer, whether, over time, the area of effect from disposal is going to move or migrate.

A. The main reason that I don't think that it's a -- that I interpreted it to be a static reservoir is the fact that not only the well that we drilled, the Jillson well, but in studying some of the surrounding Entrada tests in picking this location, the Entrada, with all of its water, does not flow to the surface. It has to be assisted.

We got water up to within 500 feet of the surface before it reached hydrostatic head. The Ingerson well that I had mentioned had to be swabbed; that well would not float to the surface. Therefore at least it's static in the sense that if there's water still moving into the formation, it hasn't reached a normal bottomhole pressured rating, which we interpret to be slightly less than .43.

And the only reason I had mentioned those wells to the north is when the Entrada becomes tight and that's

going to be fractured in places, that serves as barrier or partial barrier to any migration of fluids, be it water or hydrocarbons.

Q. As part of the literature search did you come up with or did the environmental search group come up with a paper that's identified on your summary here that dealt with the topic of regional flow and local flow?

A. Yes. There is reference, and we included the reference just to show the commission that we had -- just to show them all that we could find in our literature search. Right behind the logs there's a paper on the estimated direction and velocity of regional and local groundwater flow within the Entrada formation.

Q. What is the vintage of that paper?

A. That paper was written by Stone, and some other authors, in 1983 for the New Mexico Bureau of Mines and Mineral Resources. It was a hydrologic report on the water resources of the San Juan Basin, which included the Entrada formation.

Q. With the available data known in '83, what did Stone and others hypothesize to be the direction and rate of migration, if any, for the Entrada?

A. Using their data and their interpretation as a gross generality, if you would look on the -- there is a map following the bibliography that shows a structural map on

the top of the Entrada formation in the San Juan Basin, and using the available information from that hydrologic report, the water within the Entrada would be flowing due north at a rate of .2 feet per year.

Now, I do take exception with this report, as I would almost feel positive that Stone and the original authors were -- they stated in their paper that -- you can see on this map there looks to be over 100 data points scattered throughout the basin where they had Entrada penetrations to look at, but out of this 100 or so Entrada penetrations, there was only 11 wells that were studied for hydrologic physical parameters and actual measurements were taken from them.

Q. And those are shown with the boxes, are they not, on that --

A. Well, with the boxes and the wells that have some kind of little number written beside them.

Q. Oh, I see what you're saying. If there is a number next to a well dot, then that was a well that --

A. That has some actual data.

Q. And when you look around the spot where the Jillson well is located, none of those data points was utilized then as a part of the basis to prove their hypothesis?

A. They were used only in the sense that that was

the only data available, so they attempted to make an interpretation for the whole basin based on scattered, and in this case, not very well-placed data points.

Q. Is there new evidence since '83, that caused you to reach any other conclusion?

A. Well, a couple of things. The actual porosity logs from the offsetting W.O. Hughes No. 6 well and the Jillson well that we drilled ourselves shows that the average porosity in the immediate vicinity is slightly less than 15 percent. Where to come up with this calculation of two-tenths of a foot per year, they took some other data from another source on groundwater which assumed an average of 17 1/2 percent porosity for the Entrada over the entire basin. Which brings to point the second exception I have to this interpretation: We do know that, again, looking at this map and the dark dot, it represents the approximate location of the Jillson, and the arrow is showing the direction of flow. The approximate location at the end of that arrow is where you start running into tight Entrada. So fluids can only move as long as there is porosity and permeability in formation. And they were not privy to -- because they weren't studying this well log, they were studying wells that had actual measurements in them, therefore, they didn't use the data that shows that the Entrada becomes tight immediately north of the Jillson well.

Q. Their conclusion then about the hydraulic conductivity of the Entrada back in '83, which they hypothesized to be 2.75 feet per day, is that really happening?

A. No, it can't.

Q. In conclusion, then are we dealing with the Entrada, at least sofar as relevant in this case, with a static acquifer?

A. As far as I can tell from all the available information we have on this well and the wells probably in a two-township radius around the Jillson well.

Q. Do you see any portion of the Entrada in this area that serves as a recharge for surface water?

A. No. You would have to go all the way south to just immediately north of San Ysidro where it outcrops near the gypsum mines up there. So we're tens of miles south of the Jillson well. And it looked like, from the outcrops there, that water is coming out of the ground rather than going in the ground.

Q. Let's have you turn to the next portion of your geologic work. If you will help me find the exhibit tab that contains some more of your technical displays, we'll address those.

A. I included, under Exhibit 7, if you turn past -- go two or three pages past the map that shows the radius and

the location of the Jillson -- I have prepared two exhibits, which are both cross-sections, cross-sections A and B to accompany this, the proceeding for today. I accompanied them with more or less an excerpt of the previous spreadsheet that we were looking at that showed the formation and ages and thicknesses and lithology of the formations encountered in the Jillson well. And I just wanted to show the similarities and overall thickness and the continuity, the lateral continuity of the seals, the reservoirs, and the acquifers.

Cross-section A-A' goes from the Jillson Federal Salt Water Disposal Well over to the W.O. Hughes No. 6 Well, which is a half mile to the southeast, and because we were only able to log the Jillson up to the top of the upper Mancos shale, because of some hole bridge in problems that we had, we didn't want to stick a logging pool --

Q. Well, let's do that real quickly. I have simply taken mine out of the exhibit book, and let me show the Examiner. You've taken your two well cross-sections for the Hughes and the Jillson?

A. Right.

Q. Everything seems to correlate fine? You don't have any problems with interpretation or correlation?

A. No. It's excellent correlation.

Q. Then we get down to the Entrada, and it's

packaged between the Todilto and the Chinle, is it?

A. Right.

Q. Any material difference between the two, so that --

A. Just the minor change in relative changes in thickness of all the formations, including the Todilto and the Entrada formation. Again, we have mentioned the 26 feet of difference in thickness of the dune buildup, dune sand buildup into the Entrada formation. And when it builds up a little bit thicker, the overlying Todilto and Summerville thin a little bit. The Chinle -- none the wells in area have drilled entire through the Chinle formation. I had to go quite a ways away to find an old well that had drilled down. It was an old Pennsylvanian test, and in that well the Chinle siltstones and shales were 768 feet thick. So we're assuming that's what our bottom or floor seal for this disposal project would be.

So the correlation is, in summary, very excellent for all the formations, including the Entrada in it, just to further illustrate what a homogenous unit the Entrada is where we have -- covering the immediate well control that we have.

Q. Mr. Hobbs, did you also take the reported information provided by the Oil Conservation Division as to the location of the other Entrada salt water disposal wells?

A. Yes.

Q. And have you caused that to be plotted on a map?
A. Yeah, we had a computer base map made, and we took the list of Entrada salt water disposal wells. You want to ask questions?
MR. KELLAHIN: This is to be marked as an additional exhibit, Mr. Examiner. It's not contained within the exhibit book. We would propose to mark it for introduction as Meridian Exhibit No. 10. Accompanied to 10 is 11, which is the tabulation of the information that's been spotted.
Q. First of all, were you able to locate all of the wells on this map that are shown on the spreadsheet?
A. Yes, sir.
Q. There was some question the other day about getting an API number for some of those disposal wells, but that was resolved, was it?
A. That was mainly just for purposes of locating them with the computer. The ones that didn't have API, we just did --
Q. Did by hand?
A. -- by other means.
Q. What's the color code then for the well dots shown on the plats?
A. The blue dots were which? The blue dots were the ones that had the API number, and the orange dots did not

have an API number. The API number is not a problem because all wells have a section, township, and range, and unit locator, so --

Q. That's the only significance of the color difference?

A. It almost wasn't worth making a difference in the color designation. So that shows that the majority of Entrada wells that are used for salt water disposal purposes are located north of us. There's one well that is located south of our location, the Petro Lewis well. And there was a Dome well, which will be southwest of us, the Dome Santa Fe Barbs, which is located in 21 North, 10 West. That's the well southwest of our location, and the well that would be the closest would be the Petro Lewis Federal 12-C, which is located in Section 12 of Township 19 North, Range 4 West.

Q. Can you explain why there seems to be a grouping of disposal wells -- would you describe for us, if you know why, there's a grouping of the disposal wells in the Entrada formation north of you. Is there a reason that that has occurred?

A. The largest demand for water disposal sites in the basin really didn't come about until production was found and started in the overpressured Fruitland coal formation, which produces copious amounts of water. And

although I haven't looked up the dates on all of these, I know that most of these wells are being used for disposal, primarily of produced Fruitland coal water.

Q. Summarize your geologic conclusions about the appropriateness of utilizing this portion of the Entrada as an exempt acquifer.

A. I feel that the Entrada is a viable, safe formation based on evidence that we gathered before we drilled the well and since drilling the well. That the formation is sealed vertically both above the Entrada formation and below the formation, as far as containment. I think, due to variations in permeability, particularly north of us where the Entrada becomes tight, I feel that the waters which are -- which fills the Entrada reservoir is in a static condition, and the impact of the amount of water that we project that we would be disposing of here from wells primarily north of us, the impact would be negligible in terms of aerial extent or extent that the Entrada is a subsurface water acquifer over the whole south part of the basin.

As far as any future use of the Entrada formation, there probably are viable places to the south and southwest of our well where it would make sense economically, and there's perhaps been fewer hydrocarbons migrate through the formation leaving some hydrocarbon

by-products, which we'll hear about in the analysis of the waters at this location, that geologically and even the connate waters here make this a suitable location for water disposal.

MR. KELLAHIN: This concludes my examination of Mr. Hobbs. We move the introduction of his exhibits, which are contained behind exhibit tabs 2 and 7, plus the additional displays which were the table and map, Exhibits 10 and 11.

EXAMINER CATANACH: Exhibits 2, 7, 10 and 11 will be admitted as evidence.

Mr. Leeson, do you have questions of this witness?

MR. LEESON: Not at this time. He's answered a lot of the questions I already had.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Hobbs, what is the exact perforated interval that you are injecting into in this well, or that you will be injecting into?

A. We would be injecting from 8,404 feet to 8,659 feet.

Q. In analyzing your area of influence for the injection of this fluid, what vertical interval did you use for that calculation?

A. We dealt with the gross and the net interval, basically looking at the whole sandpack.

Q. Are you talking about the whole Entrada formation or one particular sand within that formation?

A. No, the entire formation.

Q. The entire Entrada formation.

A. Yeah. Being as how there are no shale breaks, there's not any real gamma ray markers, there's some differences in porosity, but those aren't correlatable over any long distance. I haven't found any suitable means of subdividing the Entrada into anything smaller than just the gross interval.

And when we lose sand, the 7 percent and less porosity usually occurs on the bottom. So when we go from 268 feet to 253 feet that's usually -- the sand becomes tight down near the bottom, probably due to migration of iron from the underlying Chinlee formation, basically the red beds that you see when you drive across of the countryside.

Q. Is that, in fact, the number that you've used is 253 feet?

A. For the calculation of the radius of influence, yes.

Q. And that's 253 feet with porosity greater than 7 percent?

A. Right.

Q. But that also ranges up to a maximum of 22 percent; is that correct?

A. Right. In the Jillson well and the W.O. Hughes well, it ranged up to -- there was one zone that had 32 percent porosity. And that's a relatively modern well. I think it's 1981. So it's got pretty good logs on it, as far as quality goes.

Q. But that 253 feet interval, all of that interval is at least 7 percent porosity?

A. Right.

Q. So you've taken your injection interval, your actual perforated interval, but you've expanded -- where that water is going to go, you've expand it into that whole interval?

A. Yeah, right.

Q. Is there, in fact, sufficient permeability within that formation for that to occur?

A. We believe that there is. We don't see any kind of breaks, noticeable breaks on the gamma ray that show any kind of a lithological break. On the SP curve, which gives you some indication of permeability, you don't hardly see any variation on that. So although we see porosities ranging from 10 percent up to 22 percent, if you had any minor fracturing of those zones, and even without fracturing

of those zones in 10 percent, I don't think you could put water like in the bottom part of the Entrada and keep it from migrating to the upper part of the Entrada, and vice versa. See geologically, I would see it as just being one big container.

Q. Would that formation, would that injected water maybe have a preferential, would it prefer to migrate in a horizontal direction; would the permeability be better at a horizontal than close to vertical?

A. You would look at the logs and say possibly, but if you understand the -- you know, the upper part of the Entrada formation is where the better part of the bulk of the real good porosity is. And so I think you would intuitively think that the water would get in that zone and take off and you would have better permeability. But if you look at the Entrada formation in outcrop, those sands, because they are the aeolian sands, deposits on a dune, those sands have very steep foreset crossbeds to them. And therefore, for the water -- I think you're going to have some barriers to migration going across those foreset beds in this direction, as opposed to if the sands had been deposited with real good porosity in horizontal sets.

And I think the best case in point that shows that even though you have real good porosity, the nature of the bedding can make a difference, the Weber formation,

which produces from the Giant Rangely field is a different age. It's Pennsylvanian in age, but it's also made up of a 600 foot thick interval of aeolian dunes. So on logs, I don't think you could tell it from the Entrada from the Weber. They thought for years, the operators of that field thought for years that being as how they had one huge thick sand package, that they could go in and just shoot gross intervals and they would be able to drain the whole package. And they have gone in the last few years running TDT logs and have found isolated undrained reservoirs within that 600-foot thick package.

So I think the nature of the bedding, which is going to influence minor variations in permeability -- I kind of went in a roundabout manner -- I think you're vertical permeability is going to be just about as good as your horizontal permeability.

Q. The area that's projected to be affected is based on what injection rate, do you know?

A. That would be better answered by Sean, who is going to come after myself.

Q. Okay. The ceiling above and below the Entrada, you stated would be by the shales; is that correct?

A. Right. The other cross-section that we didn't go over is probably not worth pointing it out, that cross-section is a composite of the wells around the

Jillson, because not all the wells, you know, log through the right intervals, because I had to use PC wells for some and Dakota wells for others. But it basically shows -- I correlated the San Jose, Nacimiento, Ojo Alamo, Kirtland, Fruitland, and PC on that. So the cross-section B-B' does show the shallow acquifers underlaying by the hydrocarbon-bearing Pictured Cliffs and Fruitland coals in this area. The correlations aren't quite as easy to make as they are on the first cross-section, up in that Tertiary section.

Q. Mr. Hobbs, do you know whether or not the Entrada is used in some areas of the basin for water, as a water source, drinking water source?

A. Not to my knowledge, no.

Q. You stated that it outcrops considerably south of here, of the Jillson well?

A. Yeah. I always marvel driving between Albuquerque and Farmington at the outcrops around San Ysidro and probably north of San Ysidro, on Highway 44, because there's a breached anticline there just to the west of the red beds of the Chinle formation. So I always marvel and look, driving through the exposed anticline there. So that's probably exposed for another five or six miles north of San Ysidro, and then it dips north in the basin.

Q. You also stated that it appeared that the water

was flowing out of that formation?

A. That one particular outcrop, right as you are coming into the San Ysidro, there at the base of the outcrop in the alluvium, there's three definite places that water is coming out of the outcrop. You can tell it's got -- the ground is iron-stained. The water that hasn't dried up has a, kind of an iron iridescent sheen to it. And you can tell that it's affected the vegetation around there.

Q. It's your opinion that this affected area within the Entrada is not going to migrate to very much extent?

A. I really don't think so. I think there's too many stratigraphic variations, even though on logs it looks like a fairly complete package, I think when you start correlating the Entrada over a greater distance than one or two miles, there are enough stratigraphic or permeability variations to prevent any even medium range migration, which is partly understandable considering that there are some producing oil fields south of us. Also, oil has been stratigraphically trapped in those fields. They are not closed anticlinal structures; they are actually stratigraphic traps within the Entrada that trap the heavy oil.

MR. LEESON: May I ask a question?

EXAMINER CATANACH: Yes, sir.

EXAMINATION

BY MR. LEESON:

Q. I understand there are some extensive underground flows down the Rio Puerco, which is just on the other side of San Ysidro?

A. Uh-huh.

Q. Is there a chance that could be -- this water has to go somewhere when you put it in there, and you said it migrates north, and here we are way south --

A. I'm not sure I understand what you mean by "underground flows."

Q. Well, this is purely hearsay, but I have a welldriller friend that has drilled wells in that area, and all of a sudden the bit drops and then there's water, and you hear water flowing?

A. Uh-huh. Do you know about how deep that would be, approximately?

Q. No, I don't know.

A. Like 100 --

Q. I don't have enough particulars, but his raising the question made me think.

A. Yeah. That wouldn't be suprising to have good water sources close to the surface. I think close to the surface the Entrada formation could be a water source, because during the wintertime, during the snowpack, you're going to melt water and it's going to go down pretty close

to the outcrop and charge up that formation.

Q. I was just wondering if there was a chance. You said it slopes to the north, but here we are north of --

A. Well, north of San Ysidro, but south of San Ysidro we're starting to get into a different geological province. All the formations -- we're actually getting into the Rio Grande rift zone where all the formations are -- that start out nice and level that are all faulted and broken up into different blocks, and that's why you've had volcanism, volcanic flows come up when you start getting close to the Rio Grande river. So we're in a different geologic province, and we do have the outcrop area that gives us a break in between those two areas that makes them kind of unrelated in a way.

EXAMINER CATANACH: Anything further?

MR. LEESON: No, we'll get back to that well after a while, when this other boy gets up here.

EXAMINER CATANACH: Okay, I'm done with this witness.

MR. KELLAHIN: I have a couple of follow-up questions, Mr. Examiner.

FURTHER EXAMINATION

BY MR. KELLAHIN:

Q. If you will turn to the last page of Exhibit 2, just before you reach the Exhibit 3 tab. It's the schematic

for the Jillson well. The very last page in Exhibit 2. Are you with me?

When you look at the bottom right corner, it says "Entrada Perforations," and you get the "238 feet" and "476 holes"; what does that mean?

A. Well, they shoot more than one shot per foot. That looks like exactly two shots per foot. So for one foot of depth, we'll shoot perforations, drop down another foot and shoot two more perforations. So that's kind of density of shots or perforations you have per foot over that interval.

Q. In terms of that way to expose the Entrada formation to this disposal fluid, then the opportunity exists for that fluid to access the entire Entrada interval?

A. Right, yeah. So we, in effect, are trying to communicate as much of the entire formation as we can.

Q. In terms of the parameter of total dissolved solids for this well, it's in the range of 7,000 milligrams per liters?

A. Uh-huh.

Q. Is there a range of TDS for the Entrada as we look at some of these other locations within the Entrada?

A. Yeah, there seems to be, which I think is further testimony to the fact that this isn't over the south part of the basin a uniform formation that has uniform thickness,

porosity, and permeability. In the producing fields that produce south of us, and Media field, which is in 19 North, 3 West, the Entrada is at 5,300 feet. This is a producing oil field. The produced waters, the salinities of the produced water is 2,500 parts per million. In Papers Wash field, a field in 19 North, 5 West, production is from 5,200 feet. The salinity is 3,000 parts per million. Eagle Mesa field, 19 North, 4 West, 5,500 feet. Salinity is 6,200 parts per million. Ojo Encinio and Snake Eyes fields produce from 56- and 5,900 feet, and their salinities range from 10,700 to 11,100. There's also a well -- the Superior Sealy Federal -- or Sealy Government 1-7 that was drilled in Section 7 of 25 North, 6 West, the drill stem tested the Entrada formation, and there they report salinities of 80,000 parts per million, which I thought sound a little bit high, but we don't have any of the original data to dispute or believe anything other than the reports that we have.

MR. KELLAHIN: Thank you, Mr. Examiner.

All right, at this time I would call our engineering expert, Sean Woolverton.

SEAN WOOLVERTON,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. KELLAHIN:

Q. Would you please state your name and occupation.
A. Sean Woolverton. I'm a petroleum engineer for Meridian Oil.
Q. Where you reside, sir?
A. Farmington, New Mexico.
Q. On prior occasions have you testified before this agency as a petroleum engineer and had your qualifications accepted and made a matter of record?
A. No, I have not.
Q. Summarize for the examiner your education.
A. I received a bachelor of science in petroleum engineering from Montana College of Mineral Science and Technology in December of 1992.
Q. Summarize your employment experience.
A. I've worked for Meridian Oil as a reservoir engineer for the past two years.
Q. Are you a part of Meridian's team that is assigned the responsibility for an area that includes the Jillson Federal Salt Water Disposal Well No. 1?
A. Yes, I am.
Q. What has been your personal involvement with that project?
A. I've served as the reservoir engineer on this project from its onset.
Q. From its conception, during the drilling, and now

you've continued in that role?

A. Yes.

Q. Based upon your reservoir engineering studies, do you now have expert reservoir engineering opinions concerning an area of the Entrada acquifer that, in your opinion, qualifies to be exempted as an exempt acquifer under the rules and regulations of the Oil Conservation Division in coordination with the Environmental Improvement Agency's guidelines?

A. Yes, I believe so.

MR. KELLAHIN: We tender Mr. Woolverton as an expert reservoir engineer.

EXAMINER CATANACH: He is so qualified.

Q. (BY MR. KELLAHIN) If you will turn with me to the information behind Exhibit No. 2, and then if you will thumb through that, let's go back again to the plat that shows the ultimate injection radius.

A. Okay.

Q. What does that mean?

A. The ultimate injection radius is the radius which I have calculated will be impacted by the estimated volume of water that will be disposed in the Jillson.

Q. All right. So when we go to the first page behind exhibit tab No. 2, we can see what you have ultimately gone through to determine what that area is?

A. Correct.

Q. All right. Have you and the team been able to reach an expert opinion with regards to whether or not the Entrada acquifer is now being used as a drinking water source?

A. Yes, we have.

Q. What is that conclusion?

A. In this area, the Entrada is not being used as a drinking source.

Q. Do you see any future potential use for this acquifer as a drinking water source?

A. At this depth and location, I don't see the Entrada as a future source of drinking water.

Q. Describe for me your principal reasons why not.

A. First off, because of the location and depth it makes it an extremely expensive venture to drill the Entrada for drinking water.

Q. In fact, it is so expensive, it is economically impracticable; right?

A. Correct.

Q. Give us the highlights of your conclusion -- that is your conclusion, now what are the numbers? Without going to them specifically, how expensive would it be to drill a well to the Entrada if your objective was to produce Entrada water of whatever quality to the surface?

A. With combined drilling and completion, with treatment costs, a capital investment up front of approximately $4.2 million is required.

Q. When you look at the composition or the water quality of the Entrada water, as tested in this well, what did you find in terms of the range of total dissolved solids?

A. We had several tests analyzed. TDS measurements ranged from approximately 6- to 7,000 milligrams per liter.

Q. Despite your efforts, did you ever obtain a water sample that analyzed for a total dissolved solids of less than 6,000?

A. No, we did not.

Q. All right. So when you look at the guidelines for exempting an acquifer, then is there any doubt in your mind that you have groundwater that has TDS of greater than 3,000 milligrams per liter?

A. Rephrase your questioning.

Q. When you are looking at the water composition of the well-produced water out of the Entrada, is there any doubt in your mind that we're dealing with a groundwater source that has total dissolved solids of at least equal to or greater than 3,000 milligrams per liter?

A. The water that we encountered was greater than 3,000. I don't believe we encountered any water less than

3,000.

Q. Do you have an opinion as to whether it is reasonably expected to supply a public water system?

A. Again, at this depth and location, I believe that it will never be used as a public water system.

Q. Let's start with exhibit tab No. 2 then and have you go down and help me summarize some of the technical components by which you have answered these questions. And to aid the Examiner, I think you have utilized what is distributed by the EPA in Dallas as a guideline information of requested information?

A. Yes. The guidelines that were provided by the EPA, we went through those and answered them one by one. I guess we can start off and discuss the estimated area of influence calculation. That's given on Appendix A, Figure One, behind Exhibit 2.

Q. All right, let's turn to that. If you will help us find the engineering calculation.

A. This is an accepted calculation that can be found in almost reservoir manuals.

Q. All right, let's explain why you have chosen this particular formula.

A. There's several assumptions that you want to take into account. First off, we do have a static reservoir. And secondly, the reservoir that we're dealing with is 100

percent saturated, which is verified by logs.

Q. Why is that of significance to you as a reservoir engineer when you deal with a water saturation of 100 percent?

A. It states that there is no room, no more room to place water in the reservoir, therefore all storage capacity will be result of compression of existing reservoir fluids and the existing formation.

Q. All right. So I understand this as a layman, you have a finite container?

A. Correct.

Q. The Entrada is the static reservoir. In order to put this water in that reservoir there has to be some compressibility that takes place?

A. Correct.

Q. It's a large enough container with sufficient thickness that there's room within that container to add "X" number of additional barrels of water?

A. Correct. You'll experience it through compressibility of the reservoir fluid and of the formation itself.

Q. Any inherent weakness in that engineering concept?

A. Based off the data that we have, I don't believe so.

Q. Your calculation shows that you're calculating the assumption that you are ultimately going to put six million barrels of water into this well?

A. Correct.

Q. Where does that number come from?

A. That number was estimated from a review of existing Meridian wells that will be serviced by the Jillson Federal and estimating the water production from these wells over the service life of the Jillson Federal.

Q. When you take all that potential water production and add it together, what was the total volume?

A. I estimated the total volume to be four million barrels.

Q. And then what did you do; how did we get to six?

A. To account for possible increase in water production in the future, new wells that will be serviced by the Jillson Federal, I included a 50 percent error factor, therefore coming up with six million barrels.

Q. Tell me about the height calculation.

A. Again, referring back to the comments that Bill made, the net effective injection zone of 253 feet was determined from using a 7 percent porosity cutoff from density logs over the Entrada and the Jillson Federal.

Q. Did you agree with Mr. Hobbs about the 7 percent porosity cutoff value?

A. Yes, I do.

Q. And based upon that cutoff then what do you use for the average porosity?

A. Based off the 253 feet present or considered effective pay, an average porosity of 14.8 percent was calculated.

Q. Then your next number is simply a compressibility number?

A. Yes, sir. This total compressibility assumes compressibility of the reservoir fluid, which I'm considering water, and the consolidated sandstone present in the Entrada Formation.

Q. Then delta P of 1453 psi, what's that?

A. That takes into account an initial gradient of .43 psi, and an abandonment gradient of .6 psi, and then took into account an average depth of 8,532 feet in this well.

Q. Is there any additional pressure added at the surface to inject water into this well?

A. Yes, there will be.

Q. Have you taken that into consideration in this calculation?

A. Yes, I have.

Q. What have you used in your calculation as a pressure? We're used to dealing with a surface pressure

number. Do you have any such an equivalent number for the calculation?

A. Not off the top of my head. I can calculate it real quick.

Q. Well, what did you use then?

A. We'd just have to take the -- at the abandonment pressure, it would be the hydrostatic head -- or the surface pressure minus the hydrostatic head.

Q. When you solved for area, what did you get?

A. Back solving for the area in the above equasion, I solved for 422 acres which will be influenced, which gives a radius of 4,440 feet.

Q. Do you have any reservations about this conclusion?

A. Based off the data that we have available, I believe that this is an accurate reflection of the area that will be influenced.

Q. Do you have any engineering reservations about the shape of the area of influence of disposal of this volume of water at this location?

A. Again, I don't have any other data to make me believe that the drainage pattern wouldn't be a drainage -- or injection.

Q. Based on the geologic conclusions in your engineering work, there is no evidence to the contrary?

A. No, there is not.

Q. Was Meridian successful in its efforts to execute the drilling of the Jillson well so that we have good mechanical integrity and isolation of the Entrada from any other formation?

A. Yes. When the well was drilled, we cemented it and a CT log was run across the entire wellbore, and from that log, it was determined that good zone isolation was achieved.

Q. As part of your work, did you make a cost analysis to determine whether or not if the depth and the location of this acquifer was such that the recovery of water out of the Entrada could be successfully done for drinking water purposes either economically or technically?

A. Yes, I did.

Q. And what was your conclusion?

A. My conclusion was that the recovery of drinking water from the Entrada at this depth and location was economically impractical.

Q. Economically infeasible to do it?

A. Correct.

Q. Show us how you reached that conclusion.

A. If you turn to Exhibit 8, the cost estimates are given, tables are also given summarizing these cost estimates.

Q. All right. I've got Exhibit 8. I've turned past the cover sheet, what are we looking at here?

A. If we look below, at Tables I and II, a breakout of drilling and completion costs with treatment facilities is given. They are given at 739,000, and 3.5 million. Based off the fact that -- based off the samples that were retrieved from the Jillson, significant treatment must take place in order to bring the water to drinking standards.

Q. When you drilled Jillson well, did it naturally flow water to the surface?

A. No, it did not.

Q. What did you do to retrieve the samples?

A. We needed to swab in the samples.

Q. During the swabbing process then, were you able to determine a flow rate for the well?

A. The maximum rate that we experienced during the swabbing of oil was approximately 50 barrels per hour, which equates to 1,200 barrels per day.

Q. Okay. If this well could produce 1,200 barrels of water a day, you need to see if it's economic to drill a well to this depth at this location would produce that volume then to see if it's economically feasible?

A. Correct.

Q. To be used for a public water system?

A. Correct.

Q. When you look at the cost estimates -- you've got an AFE on the next page, how was this AFE generated?

A. In looking at the conditions, we determined that in order to drill a water well at this location for purposes of serving as a drinking source, we would have to do a similar type of -- design a similar type of casing string that we did in our disposal well. We'd have to achieve zone isolation across the existing hydrocarbon zones, we would have to set surface casing and then 7-inch casing down through the Entrada, and that was necessary to set so that it would handle a 1,200 barrels a day rate.

Q. You didn't dream this up by yourself, did you, Sean?

A. No. It was with varietal expertise to understand what components were necessary to take this wellbore and clean up the water so that it could be drinkable. In fact, we went outside of Meridian and consulted with an environmental group to design a treatment facility for us and what it would cost to treat the volume of water that we've talked about.

Q. Did you and these environmental experts that are helping you design a cost estimate to treat this water, utilize the water analysis made on water samples taken from the Jillson well?

A. Yes, we did.

Q. And all that stuff was put into this analysis?
A. Correct.
Q. Did that process include trying to clean up all the various constituents or components of the water characteristics so that it would satisfy drinking water standards?
A. Yes, it did.
Q. And when you do that, what's the cost?
A. Again, the capital investment up front for the treatment facility was estimated to be $3.5 million. A treatment cost of approximately $250,000 per year would be necessary to treat the volume of water we have discussed.
Q. Describe for us or help us understand the parts that go into what you've defined as the treatment facility.
A. That's something that I'm really not -- don't have experience on. The company that did provide it gives an itemized breakdown.
Q. That's what I'm looking for. Help me find it.
A. Here under, oh, it's about the --
Q. Fourth page from the back?
A. Yes.
Q. You are looking at the caption that says, "Burlington Environmental"?
A. Correct.
Q. And the first page then, it gives you an itemized

estimate of capital costs, and then on the second page it gives gets the you breakdown of the estimated operating cost to maintain this type of system for drinking water purposes?

A. Yes.

Q. In addition to the environmental experts accessible to you, did you also use production and drilling engineering experts within your company to examine the integrity of the Jillson well?

A. Yes. Again, based off the CT log that was run, it was determined that the integrity of the Jillson well was intact to ensure no migration of water into upper zones.

Q. When we look at this AFE in here, describe for me what it's going to cost to drill this well, complete it, case it, and put that water on the surface. I don't want my surface treatment facilities, I want to know what it costs to get it to the surface.

A. The wellbore will cost you an estimated 439,000. And that includes tubing and a pumping unit.

Q. Once we get the water to the surface, then we have these treatment facilities of 3.5 million?

A. Correct.

Q. Why that expensive?

A. Again, based off the analysis of the water taken from the Jillson Federal during the completion and bringing that to the state's regulations for drinking and/or

irrigation water, that will be the cost to meet those stipulations.

Q. One of the problems is you've got to get the hydrocarbons out of the Entrada water, right?

A. There was --

Q. You've got some benzene and some toluene standards you bust, don't you?

A. Benzene and xylene we did exceed the regulation standards.

Q. Let's go to the water analysis and show what was analyzed to be the components for the water. Help me find where to find that.

A. They are under Exhibit 6, the third page back. What I've given here is a table listing the measured quantities for the various analyses of samples taken from the Jillson, and then in the second column, the regulation standards for drinking and/or irrigation uses.

Q. Okay, you've got them summarized here, but if the Examiner chooses to do so, he can actually see the summary page of the analysis if he will look behind exhibit tab No. 4, am I right?

A. Correct. The actual analysis and the results of those are given under Exhibit 4.

Q. Okay. So those are there under 4, and if we want to summarize them, we'll go to the third page behind exhibit

tab No. 6, and that's where we'll start. Let's go down the list and show me where we bust a standard.

A. The first analysis that we want to look at is the total dissolved solids. The measured quantity from the Jillson well was approximately 6,900 milligrams per liter. That greatly exceeds the 1,000 milligrams per liter.

Q. Now, you had some analyses that were even higher than this?

A. Yes, the maximum that we did see, our experience was approximately 7,700.

Q. Okay.

A. That does place us in the 3- to 10,000 range required for a reservoir exemption, acquifer exception.

Q. Is the water treatment facilities cost component, does it address cleaning up the total dissolved solids?

A. Yes, it does.

Q. All right, continue.

A. Some of the other key quantities that were measured that exceed regulation standards include benzene -- I do have to note that one is given in microliters, where the regulation standards is given in milligrams per liter.

Q. If you make a conversion, though, you have bust the benzene standard by a considerable amount?

A. Yes. Benzene on that, .47 milligrams per liter, exceeding the .01 milligrams per liter.

Q. So you're going to have to take the benzene out of the water with the treatment facility?

A. Correct.

Q. And that's part of the $3.5 million?

A. Correct.

Q. What else do you have to clean up?

A. Xylene, again we exceed -- we sampled at .79 milligrams per liter. Regulation standards for total xylene is .62 milligrams per liter. Additional quantities that will have to be removed include nickel, which is measured at .3 milligrams per liter, exceeding the .2 milligrams per liter. Iron will have to be removed. We measured 43 milligrams per liter with the regulation standards being 1 milligram per liter. And finally, lead, additional lead quantities will have to be removed.

Q. What do you do with the sulphates?

A. Again, sulphates -- excuse me, I did skip that one -- the sulphates do exceed regulation standards also.

Q. All right. The technical people that helped you price out the cost of the treatment facility, were they aware that they had to clean up the water quality based upon this analysis exceeding the standard as to these components?

A. Yes. They were provided the water analysis given in Appendix Four, and regulation standards they were aware of.

Q. We have spent more than $700,000 to get the water to the surface. We have now spent $3.5 million to treat it, and we have not yet moved it to any kind of use?

A. No, we have not.

Q. Is there any foreseeable use, in your opinion, in this vicinity for water at this rate at this depth?

A. No, I do not see any foreseeable use of quantities at this amount at this location.

Q. What are the ranchers in the area in the immediate vicinity, I guess Lindrith is the closest "municipal system" -- "public system," what are they using for water?

A. They are using set shallow acquifers. The Lindrith community, in particular, has a well, water source well which is taken from the San Jose at approximately 1,100 feet.

Q. Do you see any engineering evidence that the Entrada acquifer in this area is in any way hydrologically connected to any other formation?

A. No, I do not.

Q. No contact between that reservoir and any fresh water sands?

A. No, there is not.

Q. What is the estimated life of the Jillson well? We're forecasting four million barrels. You've added

another two million. That's total volume. Now give us a sense of the life.

A. The life of the Jillson disposal well, I'm estimating to be approximately 50 years.

Q. Summarize then, Mr. Woolverton, what your engineering conclusions are with regards to the issue of whether or not the cost and analysis for this location at this depth shows that this acquifer can be utilized economically as a feasible drinking water source.

A. Because of the excessive costs that will be required to drill a well to this depth, the costs that will be required to develop a treatment facility and then treat the water as it's being produced makes it economically impractical when you look at shallower alternatives available in the area and for the amount of demand for this quantity of water in the area.

Q. If a rancher or a community is looking for a source of drinking water, what are the alternative sources for which the Entrada would have to compete?

A. They would have to compete with the formations Bill mentioned previously, which consist of San Jose, the Ojo Alamo -- the other one is leaving my mind right now -- the Nacimiento, which is approximately 2,500 foot of sands.

Q. When you are looking at the Entrada as a source to compare to other alternative sources, what's your

conclusion about whether it provides a competitive alternative source of drinking water?

A. I think it does not provide a competitive source. It would be absurd to drill to the Entrada when you have available, at an extremely lower price, water at the quantities at shallower formations.

Q. Do you see any present or reasonable foreseeable use of the Entrada in this area for drinking water purposes?

A. No, I do not.

Q. Do you see it as a present or reasonably foreseeable use for agricultural or stock watering purposes?

A. No, I do not.

Q. Have you examined the waters analysis and satisfied yourself that the water samples were collected with the appropriate handling and protocol and that those analyses have been conducted with good scientific discipline?

A. Yes.

Q. Do you find any inaccuracies in those samples that are of issue that we should identify for the Examiner?

A. No, we had the water samples tested by more than one company, and, overall, the analysis came back in a consistent manner.

Q. Summarize your conclusions for us, Mr. Woolverton, about whether the area that we have identified

as the exempt acquifer area portion of the Entrada should be approved by this Examiner?

A. Based off the area of influence that will be experienced in the Jillson Federal, the Entrada will not ever in foreseeable future serve as a drinking source supply because of its economic impracticality; therefore, I believe that the Entrada should be exempted as a disposal zone at this location.

Q. One of the items that we talk about when we think of managing and protecting potential freshwater acquifers is to establish some type of monitoring scheme, if you will. I think it's specifically addressing shallower sources, quite frankly, but do you see any engineering reason, necessity, to establish some type of monitoring program to determine an area of exempt acquifer for the Entrada?

A. No, I do not. And maybe I might have to ask you to rephrase your question. You're discussing a monitoring of the reservoir or are you discussing a monitoring of the wellbore?

Q. I didn't make myself clear. There may be some unique circumstances where an acquifer, in one portion of it can be utilized for disposal purposes but we're concerned because the acquifer is so dynamic and in motion that you need to continue to monitor this contamination plume because the thing is moving all over the place. In this instance do

you see any reason to establish a monitoring system around the perimeters of our exempt area to make sure it doesn't move?

A. No, I do not. I feel the area of influence that we've determined uses sound engineering data and sound engineering principals and therefore accurately reflects the area that will be influenced over the life of the well.

Q. And if it were to move for some unforeseen reason, there's no practical reason to use the Entrada as a source anyway?

A. No, there is not.

Q. It's already got TDS pretty high, and it has hydrocarbons in it?

A. Correct.

Q. In addition, do you see any engineering reason to put monitoring wells to monitor for potential vertical migration?

A. No, I do not.

Q. Are we sufficiently deep enough with enough geologic containment so that we don't have to put monitoring wells around Mr. Candelaria's and anyone else's freshwater wells in this area to keep them from being contaminated?

A. No, no additional monitoring wells will be required.

Q. As part of the mechanical integrity of the

Jillson well -- in fact that wellbore is configured in such a way that -- it is in fact a monitoring well?

A. Yes, it is. And I believe there is a diagram showing the proposed wellbore diagram. It might take me here a little bit to find it. It's the last page under Exhibit 2.

MR. LEESON: Under 3?

MR. KELLAHIN: Exhibit 2.

THE WITNESS: As you can see the proposed -- what we currently have in the well and in the proposed. 4 1/2 inch plasticoated tubing will be ran. This will be isolated with a Packer set at approximately 8,200 foot. An inert fluid will be loaded on the backside to maintain the integrity of the tubing. In addition, the backside will be monitored for any pressure increases.

Q. (BY MR. KELLAHIN) Again, sound engineering is the way the division approves these things, and that's the way this wellbore is in the ground?

A. Correct.

MR. KELLAHIN: That concludes my examination of Mr. Woolverton. We move the introduction of his engineering exhibits, which are also contained behind exhibit tabs No. 2, the water analysis behind 4, the summary of those analysis as contained behind exhibit tab 5, and then finally his economic analysis that are behind exhibit tab No. 8.

EXAMINER CATANACH: Exhibits 2, 4, 5 and 8 will be admitted as evidence.

Mr. Leeson, do you have any questions?

MR. LEESON: Is this the place?

EXAMINER CATANACH: I think so.

MR. LEESON: Okay.

EXAMINATION

BY MR. LEESON:

Q. Why, since you have about 25- to 2,700 feet -- this is what I gathered from all your data -- of probable potable water at the surface haven't you put a surface casing below that?

A. Below the 2,700 foot?

Q. Uh-huh.

A. I feel that the 4 1/2 inch -- or the 7-inch casing that was set through the zones you're referring to and the cement that covers those zones --

Q. At 400 feet?

A. Through 400 feet we have two strings of casing set through 400 foot. From 400 foot on down, there is one string of casing, being 7 inches in diameter, which was set and then cemented behind the backside. A log was ran to verify that cement was covering the zones that you're referring to. So I feel that they are isolated.

Q. Do you have a copy of that log here?

A. I don't have a copy of that log present. I'm sure we can provide that.

Q. Why is it -- you predict the life of this well at about 50 years; is that right?

A. That's correct.

Q. Why is it that within about 40 years, we have a bunch of Pictured Cliff wells that are leaking today and blowing up well houses, you can set wells on fire?

A. If you look at the advances that we've made technically in the last 40 years, I believe that you will never experience any of those kind of situations because of the better grade of pipe, cementing practices, additional technical advancements that will allow us not to experience those conditions again.

Q. Have you watched them run pipe?

A. I've been on location when pipe has been ran before, yes.

Q. You know there are exposed areas of the pipe on the outside where the rust and catalytic reactions eat through those pipes; right?

A. We try to set up a facility that will not prohibit -- or will not allow corrosion to take place. We can't always assure that, but we make every attempt for corrosion not to take place. The system I'm talking about is cathodic protection.

Q. There are old casings that you folks have been using in your wells that are laying around locations that are rusting right today and some of new stuff you've laid out there now. How do you account for that if you are eliminating the rust in the well and so forth?

A. You might have to rephrase your question. I guess I don't understand.

MR. KELLAHIN: Let me ask this. If the witness at anytime feels he's beyond his expertise, I have the production engineer who testified before this agency when it approved the actual drilling and completion method that was utilized in this well. If Mr. Leeson wants to re-explore the prior case, I'm happy to do that for his education, but the right expert is sitting in the audience and not necessarily in the stand at this moment.

MR. LEESON: I'm sorry.

EXAMINER CATANACH: Mr. Leeson, are you going to be asking a lot more questions about this specific well?

MR. LEESON: Well, I have a point intact. My wells at my ranch run from from 550 to 650 feet deep. There is a well, I believe at the El Paso Camp that's 1,300 feet deep. I don't know whether you checked that one or not. That's what they tell me.

THE WITNESS: The area that you're discussing, I'm not responsible for that area. Brian can probably

answer those questions better.

Q. (BY MR. LEESON) But I have a well intact that is very polluted because of an adjoining gas well, Pictured Cliff well, that has polluted it. They have since plugged it. Meridian finally plugged it. They wouldn't admit that it leaked until they plugged it, and then they said, "You won't need to shoot any holes in it for a while. I saved some of it for stock water well, but the water is pretty badly polluted.

Do you how much oil it takes to pollute a lot of water? It doesn't take very much. And we have it in these wells. One of my neighbors blew up his wellhouse. Another neighbor just recently blew up his wellhouse. These Pictured Cliff wells are a serious problem. And before they plugged it, I could take a match and light the top of the well and burn it.

Now this is my concern. On the Cullens No. 6 they put 200 foot of surface casing in there. Elliott Oil put 750 feet of surface casing in their wells that they drilled up on the north side of my place. And this, to me, is nothing more than safeguarding. The Cullens, you had to go back and redo the cement job because you didn't do it right the first time, and I had requested a copy of the well log. I have a copy here. The BLM made you go back and redo that well in the upper surface. I'm concerned about that

because you had to blow holes in the casing to put the cement up there that other 1,600 feet, I believe Hester said. Salt deteriorates cement. Sodium. And I see that as a bad thing in itself that you had to perforate and re-pump it into it. I'm concerned about the surface casing methods that they are using. Only 400 feet in this Jillson well that you are going to be pumping probably -- what is the pressure going to be on that -- 2- or 3,000, 4,000 feet -- pounds per square inch?

A. No, that pressure won't be experienced at the surface. The gradients that were given initially would be .43 --

Q. Pounds per square inch?

A. No, .43 psi per foot. We're hoping that possibly the well will take the water, injected water without pressuring up on the casing or pressuring up at the start.

Q. Well, I have no problem with that. I just have a problem with eventual deterioration of a casing having not double-cased it and not cemented it. That's what I have problems with. And I think it's sufficient concern to express my concerns. That is the basis of my being here, really. And other than the increased traffic on the road and so forth, which I -- we're pursuing in other places too. But it needs to be pursued here as well as there. Because 40 years of this nonsense is enough. Laying out in that mud

overnight, you're wet clear up to the top of your legs. You're 70 years old, your wife is 60 years old, it isn't funny. Excuse me for interjecting that again. That's all I have.

MR. KELLAHIN: No redirect.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Woolverton, I'm looking at your estimated area of influence calculations.

A. Okay.

Q. And I believe that you said that you are assuming that the Entrada formation is 100 percent water saturated currently?

A. Correct.

Q. In your calculations have you assumed that all of this will be compressed as opposed to displaced?

A. That's what this calculation assumes. Again, if the box is -- considering we have a container, the container if it's 100 percent full, the only way you can put any more fluid into the container is to compress the existing fluids.

Q. So you are assuming that it's infinitely full at the present time?

A. Correct. Which I'm assuming 100 percent full with water, which the logs indicate. There shouldn't be any void spaces physically in the reservoir.

Q. How did you determine what the compressibility was?

A. Based off the limited data I had, I referenced a GRI study of the Entrada injection wells in New Mexico. In that study, the total compressibility for the Entrada was 10 to the minus 6, so that's where I came up with the compressibility number.

Q. Do you know what your injection rate in this well is going to be?

A. Right now we're estimating that we'll be injecting approximately 600 barrels per day.

Q. Is that projected to increase?

A. Over time we're seeing, you know -- again, with possibly increased -- our new wells being brought on, our increases in water production, maximum, of approximately 1,000 barrels per day.

Q. Are you satisfied that the Jillson well is cased and cemented adequately to prevent any of this injected fluid from migrating upward?

A. Yes, I am. And again, that is not my area of expertise, but in consulting with individuals who are, I believe it is. In addition, with the monitoring mechanisms that will be in place, I think we can state that, yes, the well will maintain integrity.

EXAMINER CATANACH: I believe that's all I have,

Mr. Kellahin.

MR. KELLAHIN: Mr. Examiner, I'm happy to tender to you Brian Ault, who is a petroleum engineer and with production expertise. He testified before Examiner Stogner about the mechanical integrity protocol. He had planned for this well. The well has now been drilled. He's available if that's an issue. He's present and certainly can testify. It would be his testimony, if called, that this wellbore has been completed, drilled, cased and tested. That it meets all the division criteria for satisfying your mechanical integrity requirements.

EXAMINER CATANACH: Mr. Leeson, do you feel the need to ask another witness about the wellbore?

MR. LEESON: Well, I'm sorry, I don't know. I'm not busy in this field. My field is agriculture, livestock. I'm not qualified, but I do know that there are certain things that are right and wrong, and when you are destroying good potable water, it's wrong, at the surface. And this is a real concern, not just of mine, but a lot of people.

EXAMINER CATANACH: I understand that there may have been some problems in the past with maybe some Pictured Cliffs wells. I don't know, but this is kind of a different situation here. This well is a lot deeper and --

MR. LEESON: I know that. That's why I am more concerned. They can mix more water with it from all the

different sources.

EXAMINER CATANACH: Mr. Kellahin, I believe the integrity of the well is really not in question, so I would pass on Mr. Ault being a witness.

MR. KELLAHIN: That concludes our presentation then, Mr. Examiner.

EXAMINER CATANACH: Would you like to make a statement, Mr. Kellahin?

MR. KELLAHIN: Just briefly, Mr. Examiner. We are aware of Mr. Leeson's concerns. We believe Meridian will address those concerns. His issues are not issues of relevance to you with regards to this particular activity we're asking you to approve. This wellbore has been approved by this agency. It has been drilled and completed with modern day science, with modern day materials and equipment. It passes all tests for that mechanical integrity. What we're asking you to focus on is exempting a portion of the Entrada as an exempt acquifer so that we may put these produced waters into the Entrada formation.

It has been conclusively established that there is no present or foreseeable beneficial use that this Entrada water can be placed to because it is not economically practicable to do so either now or in the foreseeable future. We believe we have met all the criteria of the Oil Conservation Division and the EPA to have both

agencies approve our application, and we would request that that be done.

EXAMINER CATANACH: Thank you, Mr. Kellahin.

Mr. Leeson, would you like to make a closing statement in this case?

MR. LEESON: Well, I'm not really up to this kind of a thing, but I'll try. There are some other alternatives, aren't there? Options for getting rid of this water through evaporation? Are there other methods?

THE WITNESS: Is that a question that you're asking me?

EXAMINER CATANACH: Well, this is more of a statement.

MR. LEESON: More of a statement. Well, there are other options, and I think they should be used too. Maybe I should have asked what are the chemicals that are going in the well with the water? What is the pressure on that thing going to be? Are they using two-inch pipe as the pumping pipe, to pump it in? I should have asked all those questions, but I feel like you've already approved them, and they've already spent the money, and I feel like I'm probably wasting my time. But I'm concerned about the potable water up and above there, and that is my concern, and I think it has been neglected in all of the stipulations that I've seen in the APD's, unless it's on my land and I

hollered and screamed loud enough.

And that is, for future reference, I think that it needs to be tended. If this is the agency that sets these standards, then I think it needs to be handled right here. It's not just my thought, it's a good many people's thoughts. Even the people in the oil field. They know what's happening. But you don't hear it coming up from the oil companies themselves. And this is what you apparently deal with mostly here. That's about all I need to say.

EXAMINER CATANACH: Okay, thank you, Mr. Leeson.

For information purposes, I guess, this is the first step in the approval process. It's sort of my understanding that this has to go to EPA next, in Dallas, to get approved. And I'm not sure what process EPA is going to use, Mr. Leeson, but there may be an opportunity to comment directly to the EPA in Dallas in this matter.

MR. LEESON: Okay.

EXAMINER CATANACH: So there being nothing further, this case will be taken under advisement.

MR. KELLAHIN: All right, sir, thank you.

MR. LEESON: Thank you for hearing me and thank you for calling me.

EXAMINER CATANACH: Thank you, Mr. Leeson.

CERTIFICATE OF REPORTER

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

I, Diana S. Abeyta, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that I caused my notes to be transcribed under my personal supervision, and that the foregoing transcript is a true and accurate record of the proceedings of said hearing.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL, January 24th, 1995.

DIANA S. ABEYTA
CCR No. 168

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 11179, heard by me on January 5 1995.

David R. Catanach, Examiner
Oil Conservation Division